Date: 11th January 2022
Our Ref No.: OE-TJ/UT1/OUT-12

To,

Doosan Heavy Industries & Construction Co. Ltd.

Mr. Youngsoo Son– Project Manager

465 Gangnam-daero, Seocho-gu, Seoul, Korea (06611)

Contract Reference: Owner's Engineer (OE) Contract between NWEDC and JVTJ for UT-1 HEP

Subject: Submission of Review Note on Layout Drawing of Monitoring for Investigation Tunnel

Reference:

1) Drawing No. UT1-C-845-CVL-DG-70006 (1 Sheet), Rev. A dated 12th October 2021

Dear Sir,

Reference is made to the above No.1 received with transmittal No. UT1-HEP-DHI-D-0070 dated 1st November 2021, regarding layout drawing of monitoring for investigation tunnel.

Please find our comments and replies in the Review Note (RN-0044) enclosed herewith this letter.

Sincerely,

.....

Mr. Carsten GUNTERMANN
Project Manager (CRE)

Tractebel TRACTEBEL ENGIE Engineering GmbH

Enclosure:

1. Review Note (RN-0044)

UPPER TRISHULI-1 HEP (216MW)

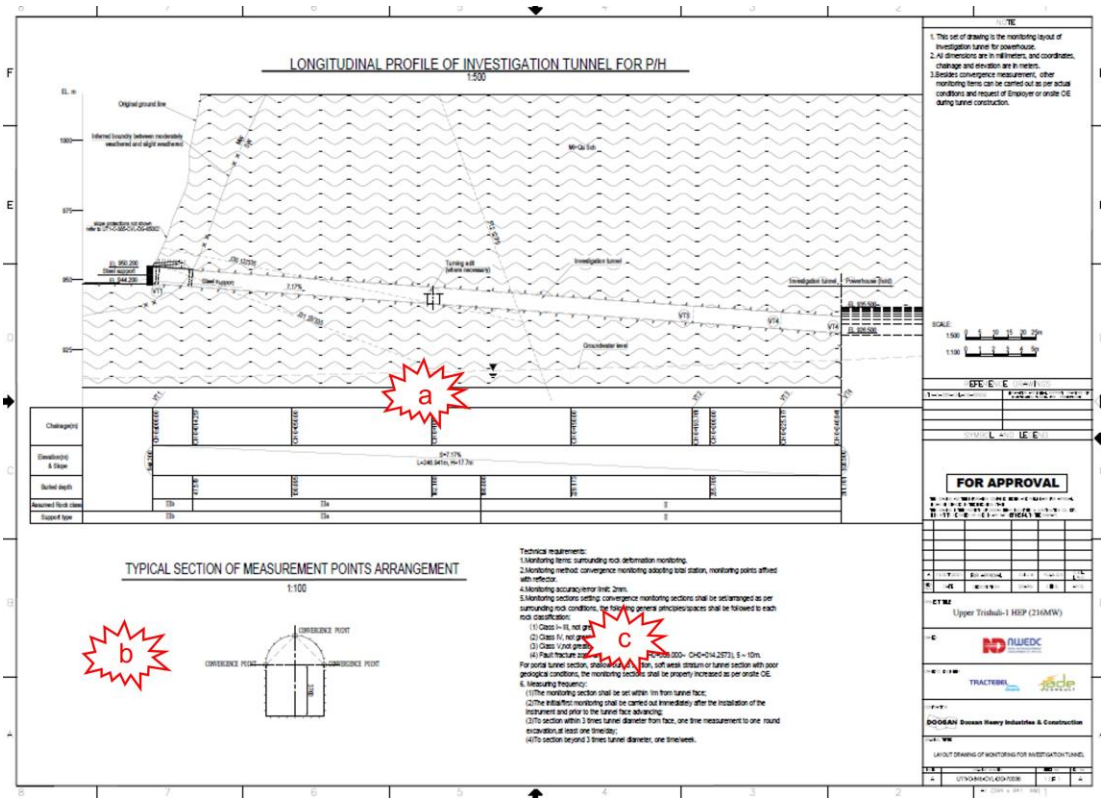
Client	**Nepal Water and Energy Development Company Private Limited**
Owner's Engineer	**Tractebel Engineering GmbH / Jade Consult**

REVIEW NOTE

Contractor	**Doosan Heavy Industries & Construction Co., Ltd.**		
Title of the Document	Layout Drawing of Monitoring for Investigation Tunnel		
Document/Drawing No.	UT1-C-845-CVL-DG-70006	Revision	A
Date of Documents/Drawings	12.10.2021	Received Date	01.11.2021
Transmittal Form No.	UT1-HEP-DHI-D-0070		
Previous Review Date/Status	N/A	Prev. Review Note No.	N/A
Review Note No.	**RN-0044**	**Present Review Date**	**11.01.2022**
		Present Review Status	**AC**

A: Approved AC: Approved with Comments RR: Returned for Resubmission

The document was received as pdf-file. To simplify the review by the Engineer and to assist the Contractor in the revision, drawings of the pdf-file were copied into this review note and marked with red letters, and corrections were suggested.



a) Up-date the section and table with latest available version.
b) Provide sketch of monitoring target.
c) See details below.

Technical requirements:

1.Monitoring items: surrounding rock deformation monitoring.

2.Monitoring method: convergence monitoring adopting total station, monitoring points affixed with reflector.

4.Monitoring accuracy/error limit: 2mm. a

5.Monitoring sections setting: convergence monitoring sections shall be set/arranged as per surrounding rock conditions, the following general principles/spaces shall be followed to each rock classification:

(1) Class I~ III, not greater than 50m; b

(2) Class IV, not greater than 40m;

(3) Class V,not greater than 30m;

(4) Fault fracture zone and portal tunnel (CH0+000.000~ CH0+014.2573), 5 ~ 10m. c

For portal tunnel section, shallow buried section, soft weak stratum or tunnel section with poor geological conditions, the monitoring sections shall be properly increased as per onsite OE. d

6. Measuring frequency:

e (1)The monitoring section shall be set within 1m from tunnel face;

(2)The initial/first monitoring shall be carried out immediately after the installation of the instrument and prior to the tunnel face advancing;

f (3)To section within 3 times tunnel diameter from face, one time measurement to one round excavation,at least one time/day;

(4)To section beyond 3 times tunnel diameter, one time/week.

a) Nowadays (total station), a much higher accuracy can be achieved (<< 1 mm). Revise.
b) In Class I and II there is generally no monitoring required, only if instructed. Revise.
c) Refer to portal zone, only. Revise.
d) Generally, the monitoring points cannot be set up so close (1 m) to the face as they would be damaged by fly-rock. Revise to “as soon as possible”, or similar. Also mention that the points need to be protected from fly-rock.
e) This requires that the surveyor is available during installation. Note that this must be the case.
f) Mention that frequency shall be adjusted to the experienced rate of displacements of the targets. Make reference to the relevant clause in the Specifications.

DISCLAIMER

Any approval will not release the Contractor from any of his obligations under the Contract.

Dr. Ulrich Glawe

(Signature)